

Urban Expansion Trends and Patterns of Developing Cities in Egypt

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Urban Expansion Trends and Patterns of Developing Cities in Egypt

エジプトの成長都市における市街地拡大の傾向とパターンに関する考察

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The Egyptian cities have expanded over time and different changes have occurred in their historical formation and urban characteristics. That's followed by many problems that took place either in absence or misapplication of city planning and preserving restriction laws. Additionally, despite of excessive studies and governmental attempts, the informal expansions became the main problem of the Egyptian cities that cannot be controlled until now, which needs great efforts for a sustainable solution. Therefore, this study aims to draw a thorough vision of the Egyptian cities' urban expansion problems by analyzing their urban expansion trends, patterns, problems, and the governmental responses towards them.

Keywords: *Urban growth, Sprawl, City periphery, Informal settlement, Population*
都市成長, スプロール, 都市周縁部, インフォーマル居住, 人口

1. INTRODUCTION

1.1 Background

Egypt, as an Arabic African developing country, with its strategic location in the center of the old world has become the most populous country in the Middle East and the second in Africa after Nigeria. Owing to its specific geographic conditions, which consist of penetration of the Nile River from south to east, the natural boundaries of the western desert and chain of mountains and hills in the eastern desert, most urban development in Egypt has historically taken place in the Nile Valley and its Delta that represents only 5 % of its total area [1]. Consequently, population and economic activities concentrate in this narrow and limited area, and polarization became the pattern of Egyptian life.

The rural-to-urban migration, in addition to the natural urban population growth, extensively contributed in the urban growth problems. It is accelerated by the governmental policies which favoured the urban areas particularly the large centers as Cairo and Alexandria. The continuous urban expansion of these cities presented a real threat for the surrounding agricultural lands, and leading to a serious crisis of urban degradation of their peripheries. Regard to wide uninhabited desert areas, the problem is not due to land shortage but in fact due to misapplication of city planning procedures and weakness of protection rules.

However, the city planning process for urban

expansions is in fact associated with problematic complexity and affected by political, social, economical, and cultural aspects of the surrounding environment. Hence, the urban expansion situation is in urgent need to a comprehensive study for a sustainable solution.

1.2 Research Objectives

In the above context, the main objectives of this study are:

- 1) Overviewing the urban expansion problems of the Egyptian cities.
- 2) Drawing a thorough vision for the urbanization process in Egypt, the urbanization magnitude, the urban expansion patterns of the Egyptian cities and their problems.
- 3) Outlining the government responses towards the problems.
- 4) Abstracting the emerging debates concerning the problems.

1.3 Research Methodology

Due to the research nature as a descriptive and analytical study, it was constructed depending mainly on:

- 1) Literature review of previous researches and debates about the urban growth issue in case of Egypt.
- 2) Arrangement and data analysis.
- 3) Statistical analysis of the urban population growth.

2. OUTLINE OF EGYPT

2.1 Geography and History

Egypt is located in northeastern Africa and includes the Sinai Peninsula (also seen as Sinai), which is often considered part of Asia [2].

Egypt covers a total area of 1,001,449 km² (land:

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995,450 km², water: 6,000 km²). The country's greatest distance from North to South is 1,024 km, and from East to West 1,240 km. Its natural boundaries consist of more than 2,900 km of coastline along the Mediterranean Sea, the Gulf of Suez, the Gulf of Aqaba, and the Red Sea. Egypt has land boundaries with Palestine, Sudan, and Libya (Fig.1). Its geological history has produced four major physical regions; Nile Valley and Delta, where about 99 % of population lives, Western Desert, Eastern Desert, and Sinai Peninsula [3]. The country population is 72.6 million persons (2006 census) [4].

Its land use consists of 2.29% arable lands cultivated for crops like wheat, maize, and rice that are replanted after each harvest, 0.5% lands for permanent crops cultivated for crops like citrus, coffee, and rubber that are not replanted after each harvest, and 96.58% others including built-on areas, roads, barren or desert land and excluding meadows and pastures, forests and woodlands (2005) [5].

Egypt, along its long history, which is summarized in Table 1, passed through many historical stages that affected its cities' formation and their changes .

2.2 Economy

Since the revolution and independence in July 1952, the Egyptian Economy underwent several stages, passing through a socialist policy that enabled the public sector for controlling the main economic sectors, then in 1970s, the adoption of the open-door policy to liberalize the economy, encouraging remittances and private sector activity by allowing certain foreign exchange transactions at a devalued exchange rate [6].

During 1990s, a series of International Monetary Fund arrangements, along with massive external debt relief helped the country improving its macro-economic performance. But by mid-1998, the pace of structural reform

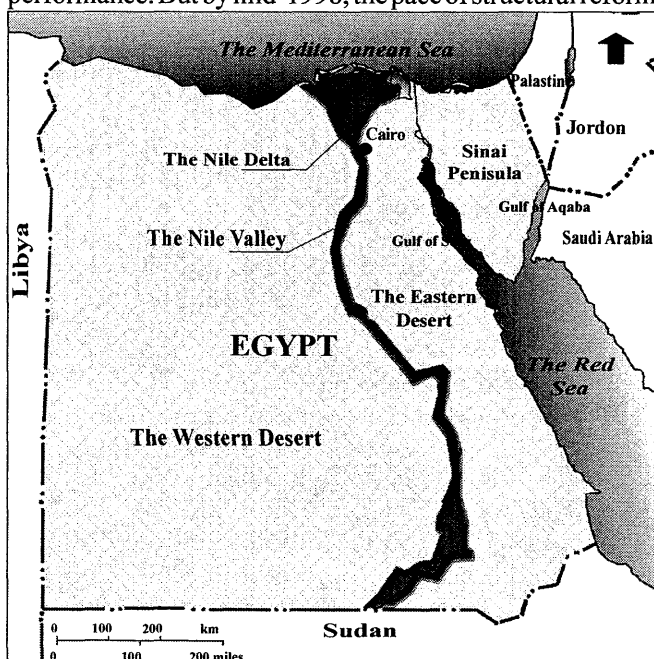


Fig. 1 Map of Egypt [5]

slackened, and lower combined hard currency earnings resulted in pressure on Egyptian pound. That pressure increased after 11 September 2001 due to the declination in tourism, Suez Canal tolls, and exports [5]. In 2005, the government reduced tax rates, energy subsidies, and privatized several enterprises. The stock market boomed, and GDP (Gross Domestic Product) grew about 5% per year in 2005 and 2006. Despite that, the government has failed to raise living standards for the average Egyptian. The market of gas export is a major bright spot for future growth prospects [7].

2.3 The Economic Sectors [7][8]

1) Agriculture: The main sector producing cotton, rice, onions, beans, citrus fruits, wheat, corn, barley, sugar.

According to estimation in 2006, agriculture's contribution to GDP has gradually declined but it remains an important activity. Even though only 3% of the total land area is arable land, agriculture accounts for 14.1%

Table 1 Brief Review of Egypt History [9]

Period	Governance	Notes
5000 BC to 3100	Precivilization	Archaeological evidence indicates that a distinct culture was developing in the Nile valley before 5000 BC
3100BC to BC332	Pharaonic dynasties	Egypt passed through the most ancient civilizations in the world extending to several millennia BC. Egypt became a unified state, until its survival as an independent state ceased in 332 BC, with its conquest by Alexander the Great.
332 BC to 30 BC	Greek & Ptolemies	The history of Ptolemaic Egypt started chronologically with the conquest by the king Alexander III of Macedon [Alexander the Great] in 332 BC and ended with the death of the queen Cleopatra of Egypt and the Roman conquest in 30 BC.
30 BC to 639 AD	Romans	That began with the conquest of Egypt in 30 BC by Octavian [the future Emperor Augustus], following the defeat of Marc Antony and Ptolemaic Queen Cleopatra VII in the Battle of Actium. Subsequently, Egypt became a province of the Roman Empire.
639 AD to 1252 AD	Arab and Islamic	Egypt was ruled at first by governors acting in the name of the Ummayyad Caliphs then the Abbasid Caliphate, the Fatimid dynasty until 1174, when Egypt came under the rule of Saladin, whose dynasty, the Ayyubids, lasted until 1252. The Ayyubites were overthrown by their Turkish bodyguards, known as the Mamluks.
1252 AD to 1517 AD	Mamlukes	Mamluks ruled Egypt under the suzerainty of Abbasid Caliphs until 1517, when Egypt became part of the Ottoman Empire.
1517 AD to 1798 AD	Ottoman monarchy	Egypt was conquered by the Ottoman Empire in 1517. Egypt was always a difficult province for the Ottoman Sultans to control. It remained dominated by the semi-autonomous Mameluks until it was conquered by the French (from 1798 to 1805).
1798 AD to 1805 AD	French Occupation	
1805 to 1882	Egypt under the Muhammad Ali dynasty	That was a period of rapid reform and modernization that led to Egypt becoming one of the most developed states outside of Europe. It also led to massive government expenditures that ended up bankrupting Egypt and eventually led to its falling under control of the Great Britain.
1882 to 1922	British Occupation	British troops landed Alexandria marking the beginning of British occupation until 1922 when Egypt was officially granted independence. British troops, however, remained in the country and true self-rule did not occur
1922 to 1952	The Kingdom of Egypt and still British control	The Kingdom was created in 1922 By the British when they granted independence to Egypt in order to suppress growing nationalism. Sultan Fuad I became the first king of the new state. Farouk succeeded his father as king in 1936. However, in that time, the British themselves were determined to maintain control over the Suez Canal.
23rd of July 1952	Egyptian revolution	That Revolution began with a military group of young army officers who named themselves "The Free Officers Movement". The revolution was initially aimed at overthrowing King Farouk. The movement had more political ambitions and soon moved to abolish the constitutional monarchy and establish a republic.
1953 till present	Republic	Egypt was declared a Republic, and ruled by Egyptian presidents until now.

of GDP and 32% of total employment.

2) Industry: Includes food processing, textiles, chemicals, petrochemicals, construction, light manufacturing, iron & steel products, aluminium, cement, military equipment. According to estimation in 2006, industry accounts for 38.4% of GDP and nearly 17% of total employment, heavily concentrated in Cairo and the Nile delta.

3) The service sector: mainly tourism, trade, banking, and shipping services on the Suez Canal, is by the far the largest and fastest-growing economic sector and accounts for 47.5% of GDP and nearly 51% of total employment.

The unemployment rate is 10.3% based on estimation in 2006. Population below poverty line, which is people below \$2 per capita per day according to the World Bank estimation for Middle East and North Africa, is 20% based on estimation in 2005 [7].

3. URBANIZATION OF EGYPT

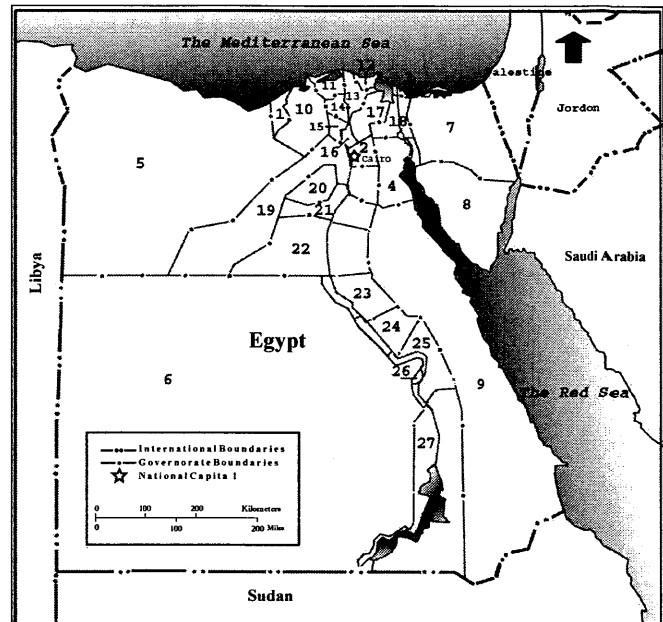
3.1 Population Growth

The population of Egypt, through its 27 governorates (Fig.2) accounts for 1/4 of the population in the Arab World. The country population is almost tripled during 1960 and 2006, increasing from about 26 million to more than 72.5 million capita in 2006 (Table2).

However, the rate of population growth has been steadily levelling off during the previous decades (2.4% during 1976 and 1986 to 2.3% during 1986 and 1996 to 2.2% during 1996 and 2006). Fig.3 shows that most population increase comes from the Lower Egypt governorates (43.05 % of the total population in 2006), followed by the Upper Egypt governorates (37.30 % of the total population in 2006), moreover Cairo Governorate (the Capital) has the highest population.

The desert governorates (Fig.4) especially south Sinai, witnessed a remarkable high percentage of population change (89% during 1986 and 1996, 172% during 1996 and 2006). That's due to the remarkable change after being sparsely populated for its marginal location, arid climate, hard topology of mountains, and occupation by Israel after war in 1967 until 1973. The government directed to develop densely the area depending on tourism development on Sea Coasts by establishing 3 nature reserves, and the national project in 1990s to create new communities besides the agriculture reclamation project in Feran Valley.

In light of these events, investment incentives were extended by law no.230/1989 for encouraging longer



Urban Gov.	Desert Gov.	Lower Egypt Gov.	Upper Egypt Gov.
1-Alexandria	5-Matruh	10-Beheira	19-Giza
2-Cairo	6-New Valley	11-Kafr el Sheikh	20-Faiyum
3-Port Said	7-North Sinai	12-Damietta	21-Beni Suef
4-Suez	8-South Sinai	13-Dakahlia	22-Minya
	9-Red Sea	14-Gharbia	23-Asyut
		15-Monufia	24-Sohag
		16-Qalyubia	25-Qena
		17-Sharqia	26-Luxor
		18-Ismailia	27-Aswan

Fig. 2 Egypt Governorates [4]

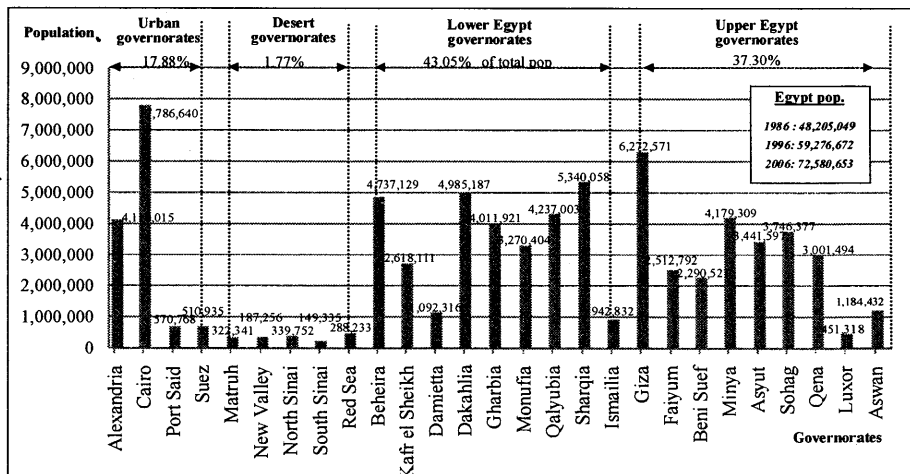


Fig. 3 Egypt Governorates' Population(2006 Census)[4][10]

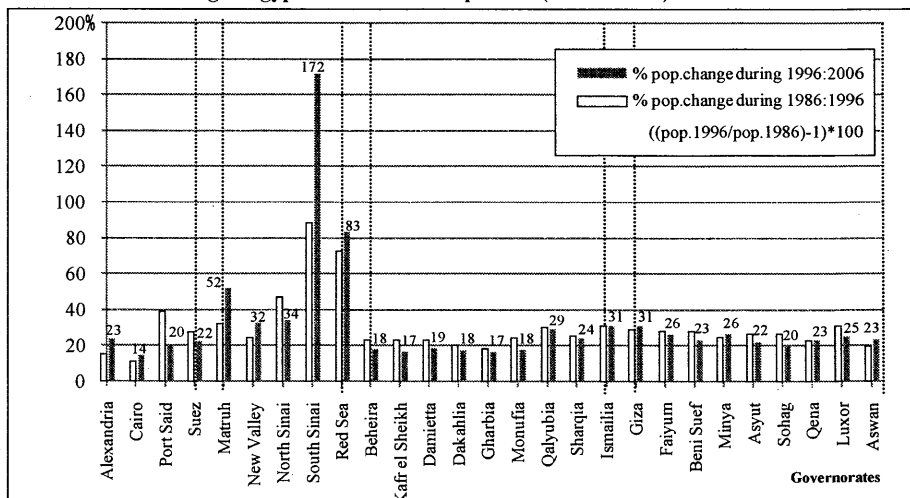


Fig. 4 Percentage of Population Change in Egypt Governorates

tax holidays for tourism projects in remote areas such as Sinai, Red Sea, Matrouh, that also highly accelerated the urban development in them [11]. Despite of that, these governorates still scarcely populated representing just 1.77 % of the country total population in 2006. That can be explained by the economic activities almost concentrated at just small areas along Sea Coasts despite their vast areas.

The average population densities in the Nile Valley exceeds 1,500 persons /km², one of the world's highest densities. Cairo, Qaliyubia, and Port Said governorates have the highest densities with more than 3,000 person/km² [2][12].

3.2 Urban Expansion Magnitude

Actually, during the second half of the 20th century, a huge urban leap took place transforming Egypt from an agricultural rural country, where the rural population accounted for more than 90% of total population at the beginning of the 20th century, to a country, where the rural population levelled off to just 57% and the urban population mounted to 43 % of total population by the end of the century[13].

Moreover the natural urban population growth, the rural-urban migration extensively contributed in the urban growth problem. That's accelerated by the governmental policies which favoured the urban areas particularly the large centers as Cairo and Alexandria. After the 1952 revolution, the government directed its major resources for developing these urban centers for economic efficiency, political, and sometimes prestige reasons. Fig. 5, 6 and 7 show that urban population is centralized in few big cities: Greater Cairo including Cairo, Giza, Shubra El-Khima cities, Alexandria, Port Said and Suez that comprise together more than 50% of the total urban population. The development mostly happened excluding the rural areas from attention except few instances of rural development experiments carried out in Mudiriati El-Tahrir in 1950s, and El-Salhia in 1970s [1].

As a result, most of Egyptian cities have witnessed an increasing population growth rates and unprecedented urban expansion. However, most of these rates relatively regressed through the period of 1996 and 2006 except some cities that continued increasing of their urban population growth rates as Alexandria, Cairo, and other cities in upper Egypt as El-Minya, Mallawi, Gerga, and Luxor for continuing high percentages of migration (Fig.5).

Moreover, the construction of the sugar factory in Edfo, and the fertilizer plant in Talkha highly raised the urban population in these cities resulting in high percentage of population change during last decades (104.1% in Edfo

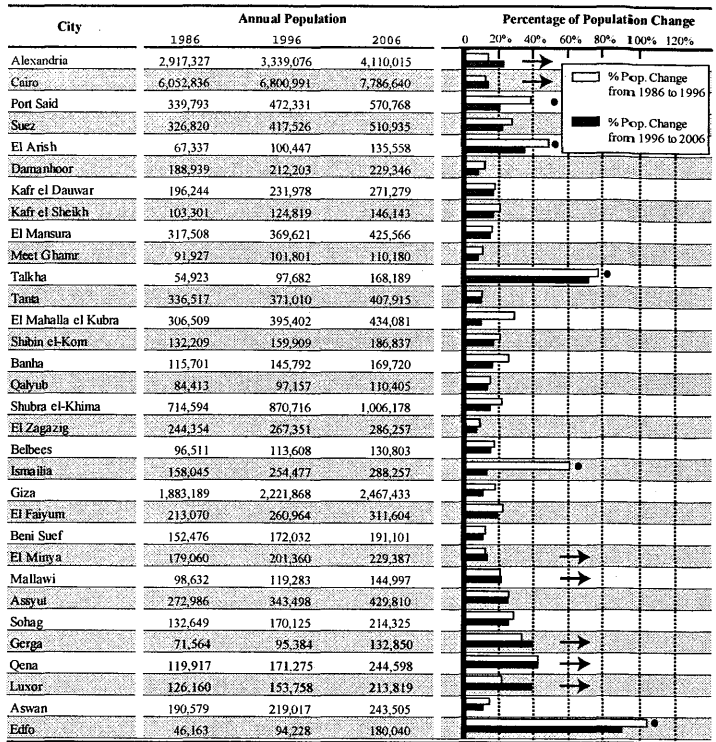


Fig. 5 Urban Population Growth of the 32 Most Populus Cities

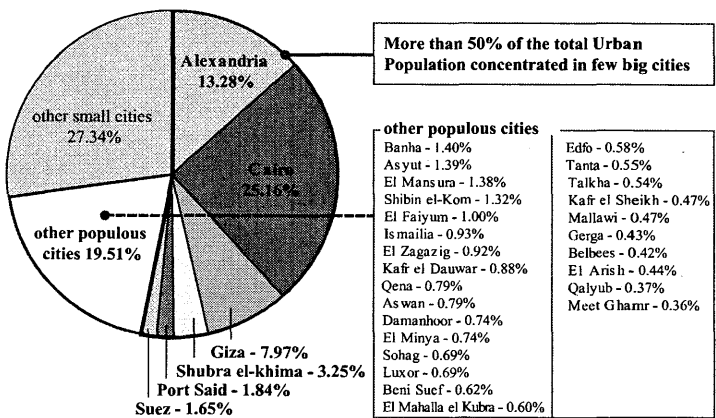


Fig. 6 Cities' Population Percentages of Country's Total Urban Population (2006 Census) [4][10]

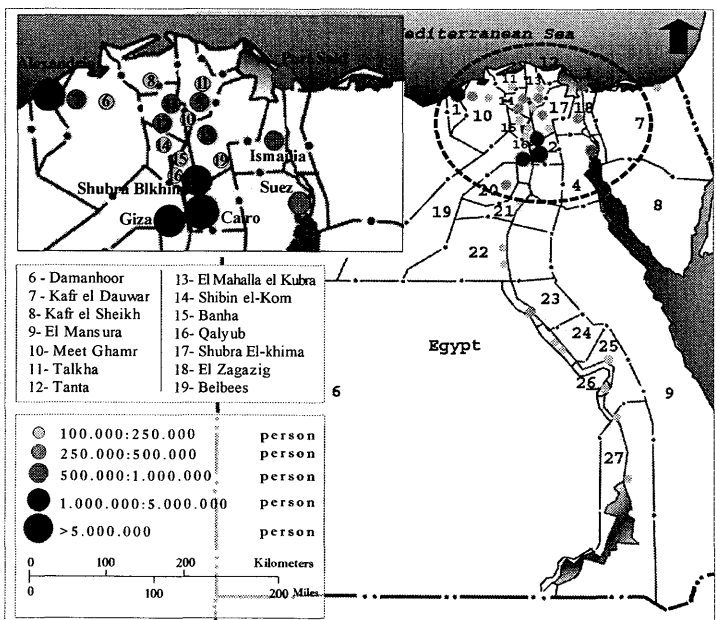


Fig. 7 The 32 Most Important & Populous Cities' Population Growth

Table2 Urban Population Growth of Egypt

year	National population (million person)	Urban population (million person)	% of National population
1960	25.98	9.87	38%
1976	43.73	19.15	43.80%
1986	48.25	21.23	44%
1996	59.31	25.27	42.60%
2006	72.58	30.95	42.64%

and 77.9% in Talkha during 1986 and 1996).

Also Ismailia, El-Arish and Port Said witnessed high percentage of population change during 1986 and 1996 (61%, 49.2% and 39% respectively). That is due to regaining Suez Canal then Sinai Peninsula after the victory in 1973 war and then the direction of the government to develop these areas.

This continued urban expansion of cities presented a real threat for the surrounding agricultural lands, as it swallowed about 80% of the agricultural lands which is mostly located on the peripheral areas surrounding the Egyptian major cities [14].

3.3 Urban Expansion Patterns of the Egyptian Cities

The task of the urban patterns classification is to develop a meaningful and manageable system of description. Here, it's intended to classify the urban expansion patterns of Egyptian cities by research on their topologies to highlight their problems for further urban solutions.

In order to reach the required classification, the previous researches on the urbanization of Egyptian cities [1], [6], [14], [15], [16], [17], [18], [19] are used as a beginning for finding their different expansion patterns. Also by searching for the worldwide different criteria for urban pattern classification [20], it's found that there is no only, right, or wrong way of classification. But actually there is a multitude of different categories for urban pattern classification including period of growth, spatial composition, land use, land ownership, street network structure, density, size, etc.

So, on the basis of the available data, moreover the importance of the informal expansion problem, certain criteria are chosen for expansion patterns' analysis and classification. Through the first phase of the analysis process, the period of primary formation (divided to Islamic period before 1805, Westernization during Mohamed Ali and his successors reign then the British Colonization from 1805 to 1952, the period of self-governance with social ideas after revolution in 1952 and the period of governance with more liberal ideas from 1970 till present) and the street network structure criteria are used for recognizing the different urban city areas. In the second phase, the degree of formality is considered including other relevant conditions as land owner-ship, previous land type, construction works registration, location according to city borders (Fig.8 and Table 3).

From above, it's found that:

First, the existing expansion patterns of most of Egyptian cities, moreover the city old core, include 1) the western expansions (before and during the British colonization), 2) the modern expansions (land subdivisions, public housing projects, new urban settlements), 3) the informal expansions on the agricultural peripheries, 4) the urban expansions by absorbing the adjacent villages, 5) the squatter settlements (on state desert lands, around tombs, and on buildings' rooftops). On the other hand, through the second analysis phase, with the formality point of view, these patterns can

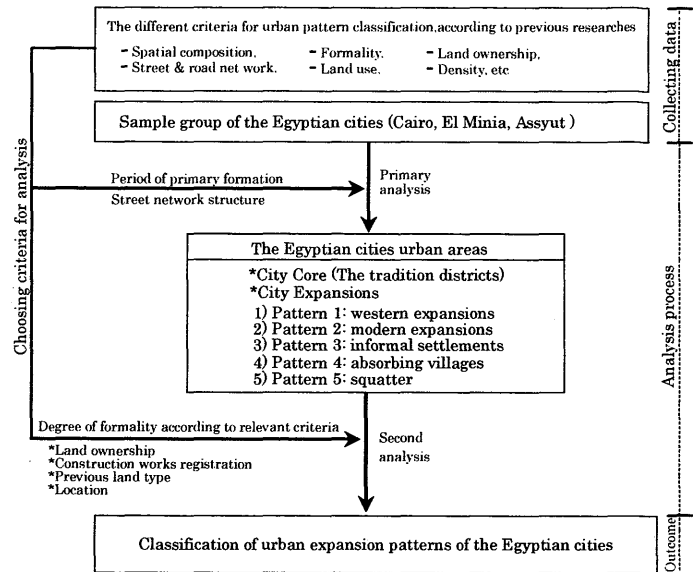


Fig. 8 Method of Urban Expansion Patterns Classification

Table 3 The Matching and Analysis Processes

Category	Sub-category	City core		City expansions				
		Tradition Islamic district	Pattern 1 Western expansion	Pattern 2 Modern expansion	Pattern 3 Informal settlements on city peripheries	Pattern 4 Absorbing adjacent villages	Pattern 5 Squatter settlements	
Period	Before 1805	*						
	1805: 1952		*					
	1952: 1970			*				
	1970: 2006			*	*	*	*	
Street & road net work structure	Tree or organic	*				*		
	Grid		*					
	radial		*					
	Linear				*			
	Hybrid (grid, linear, subdivisions)			*				
Land ownership	Private ownership	*	*	*	*	*	*	
	State property	*	*	*				
	encroachment				*	*	*	
	Others: leased, trust		*	*				
Previous land type	Agriculture	*	*	*	*	*	*	
	Desert			*	*			
	Other: rooftops, tombs						*	
Construction works registrations	Registered	*	*	*				
	Un-registered				*	*	*	
Location according to city borders	Inside	*	*	*			*	
	Out-side				*	*	*	
		Formality		Formal		Informal		

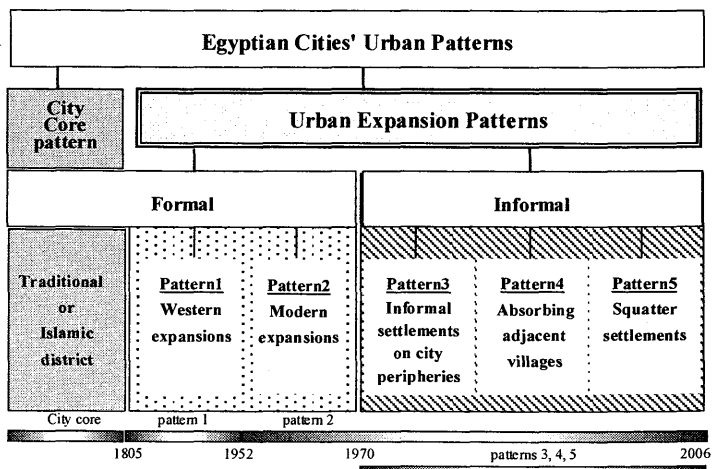


Fig. 9 Classification of Urban Expansion Patterns of Egyptian Cities (according to Period of Growth and Formality)

be classified into two subcategories “formal and informal patterns” (Fig.9).

3.4 Formal Urban Patterns

They have been introduced through the formal urban planning and housing market by the state and private formal sectors, including:

3.4.1 City Core or Traditional and Islamic Pattern (before 1800)

It was presented through the city old districts that sometimes called as the old city. It was established during the Arab Islamic period with a reflection of the inhabitants’ beliefs and religious, that taking the shape of an intermixture where the poor and the rich inhabited the same alley (hara). The division of land was not based on a uniform method and was seldom done with geometric discipline, therefore hardly ever followed straight lines with no end [6]. Table 4 shows the typology of this pattern.

3.4.2 City Formal Expansion Patterns

1) Pattern 1: Western Expansion Pattern (1805 to 1952)

This pattern passed through two stages (Table 5a) including:

1a) Western Pattern during Mohamed Ali and his Successors Reign (1801 to 1882)

Westernization attempts started in some of Egyptian cities, especially in Cairo and Alexandria as the main cities, during Mohamed Ali reign (who focused mainly on the institutional reform, importing new technologies and European teachers and advisors) [6]. Then, during (1805 to 1882) under the Khedive Isma’il reign, the number of the foreign residents rose, and westernization was catalyzed. The first western-style expansion was applied by the use of European architects from Paris. It was originated in southwest of the Old Cairo City.

1b) Western Pattern during British Colonization (1882 to 1952)

Most of Egyptian cities witnessed the European urban expansion pattern, during the British colonization period, by the construction of colonial districts (e.g. Garden city, El-Zamalek, Heliopolis, and el-Maadi districts in Cairo). The rapid development of new residential areas applying the western urban pattern was encouraged by the large increase in the number of British and other Europeans, the technological changes due to the automobile invention and the industrial revolution in the beginning of the 20th century.

2) Pattern 2: Modern Expansions Pattern (1952 till present)

Table 5b shows the typology of this pattern which includes:

2a) Massive Industrial and Housing Projects

The Egyptian cities witnessed these projects after the revolution in 1952 by the new socialist Government that heavily involved in the construction of low-cost public housing in wide scale (e.g. Nasr city expansion, Cairo).

2b) Public Housing Expansions

It was built mainly in poor areas by the socialist government, to face the growing population and the housing provision shortage, (such as the governmental housing in Helwan and Shubra districts- Cairo, and Ard El-Mold district- El-Minya).

2c) Land subdivisions

Since 1970s, with the adoption of the open-door policy and the liberal thoughts, the Egyptian cities witnessed a remarkable intervention of private developers in the urban and housing market, resulting in a massive urbanization that took place mainly through land subdivisions within cities boundaries, both on desert and arable lands (e.g. the north expansions of Cairo city, Ard Sultan & the western expansions of El-Minya city).

2d) New urban centers (satellite and independent cities)

The government directed, in late 1970s, to establish new urban centers (e.g. 6 October City, El-Obour City around Cairo City) on the desert peripheries of most of overpopulated cities to face the problem of the agriculture land encroachment by the extensively growing urbanization, to absorb the overpopulation of the mother cities and to attract new economic activities [21].

3.5 Informal Urban Patterns (1970s till present)

As urban population growth became faster than cities provision ability of formal housing, adequate infrastructure and other basic services, most of Egyptian cities witnessed the growing phenomenon of the informal expansions (sometimes called slums), which took many patterns like (Table 6):

3) Pattern 3: Informal Expansions Pattern on Agricultural Lands on City Peripheries

These settlements are mostly established on privately owned agricultural lands (on the city fringes out of the city borders), in the form of illegal subdivisions for low and middle income classes who can’t afford housing in the formal sector [17]. The expansion process follows certain sequences: the agricultural land (by several hectares) is purchased legally by a building contractor from farmers or owners and then splits the whole area up into pieces ranged between 150 to 300m² (sometimes, small land lords subdivide their land into huge number of plots ranging between 60 to 100m²). Then, these lots are sold to customers mostly of middle-income class. The informality begins with starting the construction activity, as it is against the law of agricultural land protection. But, once the building constructed and became a fact, there is a pressure emerged for legal building permission and infrastructure connection [22]. This pattern became common and a real disaster in the Egyptian development.

Fig. 10 shows the results of a field survey conducted by the Information and Decision Support Center affiliated to the Prime Minister Cabinet, in 1993, for estimating the percentage of the informal settlements built on agricultural

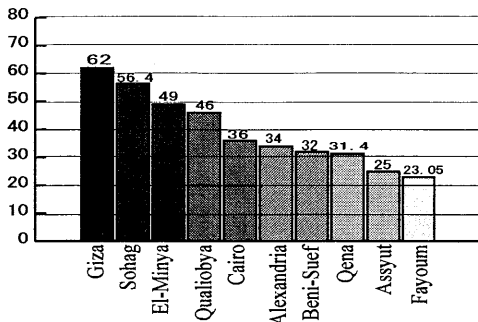


Fig. 10 Percentage of Informal Areas (over agricultural land) / Formal Areas in 10 Governorates

lands (to the formal areas) in 10 different governorates. One of these results shows that Giza city has about 32 informal extensions; part of these extensions has population of more than an average city (more than 1 million inhabitants) [15].

4) Pattern 4: Informal Expansions by Absorbing Adjacent Villages

This pattern of expansion occurs on the expense of the adjacent villages. As the city's urban area extends to attach the surrounding villages, it subsequently absorbs them into its borders. That happened in many of the populated Egyptian cities. The built-up area of Cairo, e.g., extensively expanded absorbing the surrounding villages, like El-Marg village (North-East Cairo city) which was such a village until 1990s, and then it was transformed into a small suburban then completely absorbed by the city borders becoming one of its districts.

5) Pattern 5: Squatter Settlements

The poorest of the poor, who cannot afford a dwelling in the public housing or even in the informal settlements, have no option but squatting. That happens within the following places: [17]

Table 4 Typology of Formal Urban Pattern of City Core of Egyptian Cities


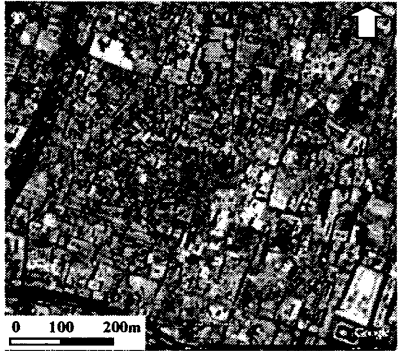
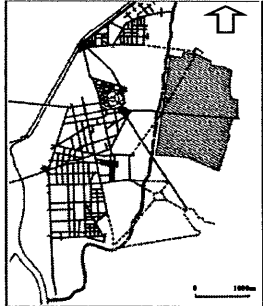

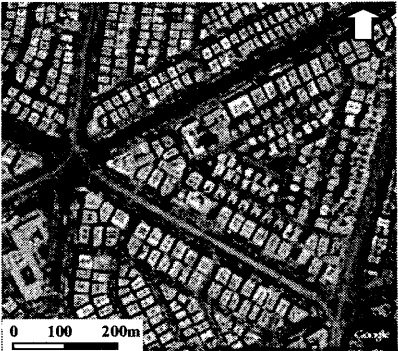
	Characteristics	Deficiencies	Maps *1
City Core Pattern Traditional and Islamic Pattern, before 1805	<p>Urban Pattern according to street network</p> <ul style="list-style-type: none"> -Tree or Organic -It is composed of aggregation of enclosed cellular units of private houses, mosques and markets all collected in a united homogeneous urban fabric [15]. <p>Buildings</p> <ul style="list-style-type: none"> -Buildings heights mostly 2 stories. -They used small wooden windows that called mashrabeya <p>Roads & Streets</p> <ul style="list-style-type: none"> -Streets were bent and narrow (2-6m) for climate treatment, concerning with the human scale and social relations. -Land division was not based on a uniform method or any geometric discipline [6]. <p>Open Areas</p> <ul style="list-style-type: none"> -No enough open areas. -just depend on the main open area in front of mosques that considered the reference points in the urban fabric. 	<p>Over time:</p> <ul style="list-style-type: none"> -It witnessed many buildings replacement by modern high-rise ones with high densities, and many changes and deteriorations occurred leading to the need for upgrading projects. -The narrow bent streets became not compatible with the motor traffic. -No enough open areas. 	 <p>0 100 200m</p> <p>Traditional or Islamic District, Cairo</p>

Table 5a Typology of Formal Urban Pattern of Egyptian Cities

	Characteristics	Deficiencies	Maps *1
Formal Expansion Patterns Pattern 1: Western Expansion Pattern (1805:1952)	<p>Urban Pattern according to street network</p> <ul style="list-style-type: none"> -Rectilinear, grid and radial plans with wider streets <p>Buildings</p> <ul style="list-style-type: none"> -European-style palaces were constructed. -Free standing structures. -Buildings facades changed by replacing the traditional small windows (mashrabeya) by the bare rectangular European one <p>Roads & Streets</p> <ul style="list-style-type: none"> -Major arterial streets were widened & realigned, and the government undertook responsibility for the construction and maintenance of the road system to be compatible with the new exported wheeled carriages. <p>Open Areas</p> <ul style="list-style-type: none"> -No enough open areas. 	<p>Over time:</p> <ul style="list-style-type: none"> -Many of the old palaces expropriated and either transformed into public facilities or demolished and replaced by high rise housing buildings. -No enough open areas. 	 <p>0 100m</p> <p>Western Development Pattern in Cairo in Khedive Ismail Era [2]</p>
	<p>Urban Pattern according to street network</p> <ul style="list-style-type: none"> - Grid and radial plans, with squares collecting up to six streets (intersections with sharp angles). -Applying European theories, as garden city theory. <p>Buildings</p> <ul style="list-style-type: none"> -Large villas. -Housing buildings 3-4 stories (4.5m height/story). <p>Roads & Streets</p> <ul style="list-style-type: none"> -Streets were almost straight and wide with grid or radial structure. -Using Boulevards and concerning with the human scale (a street width of 21-24 m was for three storey facades and a street width of 12 m for two storey buildings) [6]. <p>Open Areas</p> <ul style="list-style-type: none"> -This pattern concerned with public squares and open green areas. 	<p>After 1952:</p> <ul style="list-style-type: none"> -Many of the old palaces expropriated and either transformed into public facilities or demolished and replaced by high rise housing buildings. -New floors, different in design and function, were added to other colonial buildings, leading to district fragmentation and streetscape distortion 	 <p>0 100 200m</p> <p>Heliopolis, Cairo</p>


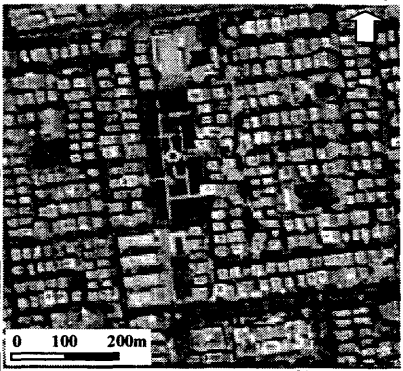

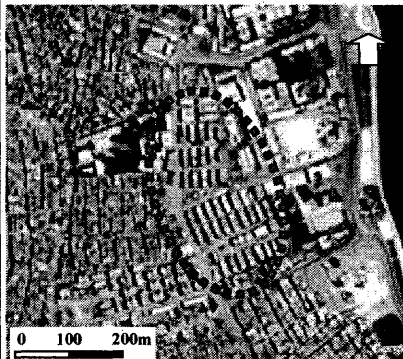
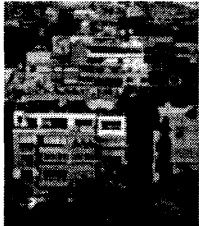
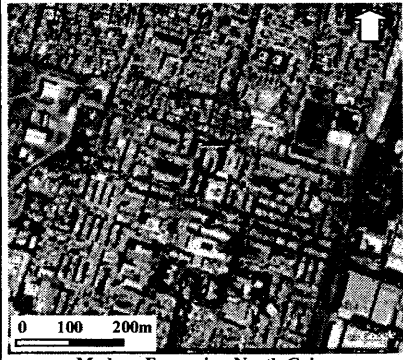

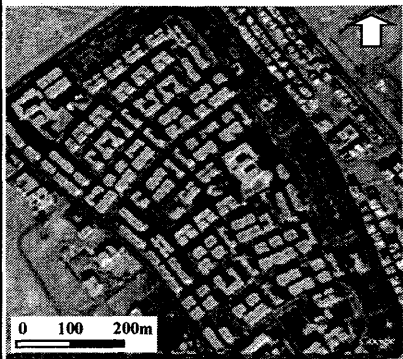
- On publicly owned lands: mostly desert lands within city fringes, e.g. Manshiet Nasr (the largest squatter area in Cairo, located at the bottom of the Muqattam hill, populated mostly by trash collectors who emigrated from rural Egypt in the 1950s. 350000 people live in the area, which suffers from poor living and environmental conditions, inadequate services, and lack

of infrastructure).

- Around the tombs in the cities of dead: within outskirts of some Egyptian cities like Cairo, the area of cemeteries provides shelter for hundreds of thousands of poor residents, e.g. the Northern Cemetery where over 300.000 Cairo locals live.

- On the houses' roof-tops: in the old Islamic districts and

Table 5b Typology of Formal Urban Pattern of Egyptian Cities (Continued)

		Characteristics	Deficiencies	Maps ^{*1}
Formal Expansion Patterns Pattern 2: Modern Expansion Pattern (after 1952 till present)	2a) Massive Industrial and Housing Projects	Urban Pattern according to street network -Grid urban pattern (but with perpendicular intersections). <hr/> Buildings -The housing buildings heights were limited to 5 stories according to the building code (2.70: 3.00 m height/story) until 1970, except high-rise ones that looking over main roads as well as governmental buildings. <hr/> Roads & Streets -Streets are more suitable for motor transportation with grid perpendicular structure. <hr/> Open Areas -These projects concerned with provision of open green areas.	-Building regulations allow constructing adjoined buildings without means (or urban design guidelines) to enforce a harmony of their shapes, colors, and so their styles, resulting in un clear visual image. 	 <p>0 100 200m</p> <p>Modern Expansion Pattern of Nasr City, Cairo</p>
	2b) Public Housing Expansions	Urban Pattern according to street network -Linear pattern. <hr/> Buildings -Repeated plans of large scale apartment blocks (five stories height). <hr/> Roads & Streets -Linear street pattern (with average width 8 m) <hr/> Open Areas -There is almost no open areas.	Due to limited finance for the public housing projects, these expansions mostly face the following defects: ^[18] -The same plans were applied typically in various geographic areas without any consideration either to different climatic conditions or to households different characteristics -These expansions became over crowded and monotonous rows. -Provided with few poor quality services. -No open urban spaces. -No parking spaces. 	 <p>0 100 200m</p> <p>Public Housing, Ard El-Mold District, El-Minya City</p>
	2c) Land Subdivisions	Urban Pattern according to street network -Grid and linear planning pattern <hr/> Buildings -Freestanding buildings up to 30m heights (building codes permitted building heights to 1.5 street width). <hr/> Roads & Streets -Streets are almost straight and wide with grid structure. <hr/> Open Areas -According to the law of land subdivision, 1/3 of land area must be allocated for roads, squares, and public parks.	-No urban design guidelines to enforce a harmony of the buildings shapes, colors, and styles, resulting in un clear visual image. -High density & traffic congestion. -Minimal spaces for car parking are provided. 	 <p>0 100 200m</p> <p>Modern Expansion North Cairo</p>
	2d) New Urban Centers (Satellite & Independent Cities)	Urban Pattern according to street network -Hybrid pattern (grid, linear, and sometimes organic). -New planning schemes for the new settlements, which followed the place planning regulations that varies from settlement to another in some details regarding the settlement location and land properties. <hr/> Buildings -Villas that varied in height between 2 to 4 stories. -Housing buildings from 3 to 5 stories (2.7:3m height/story). <hr/> Roads & Streets -Streets were almost straight and wide with grid or organic structure. <hr/> Open Areas -This pattern concerned with public squares and open green areas.	Many of these settlements faced by number of obstacles, that impede their growth, like: -Defects in housing locations management and land development processes (choice of sites, the status of the land, and water supply). -High transportation costs. -High infrastructure costs. -Decline in the number of subsidized housing lots for the low income groups. 	 <p>0 100 200m</p> <p>New City of 6 October City, Greater Cairo</p>

the adjacent areas in a zone of decay extending into the colonial districts.

4. URBAN EXPANSION PROBLEMS

Although cities contribute significantly to national economic growth, the rapid rates of urbanization in Egypt accompanied with urban legislations' defects and other economic conditions all contributed in its urban expansion problems, mainly cities' urban degradation and their informal expansions. Actually, the unplanned informal expansion has become the main character and problem of Egyptian cities' urban growth. Most of them are expanding vertically and horizontally with a directed movement, mainly of the low and middle-income residents, to unplanned settlements on the peripheries to afford suitable housing on the expense of the agricultural lands and the rural-urban fringe [23].

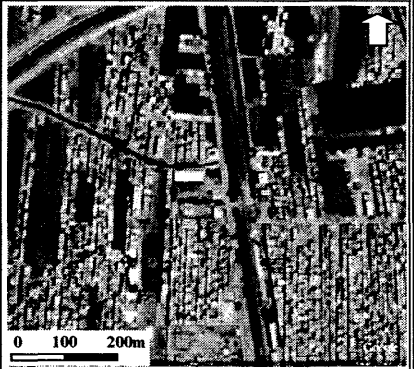
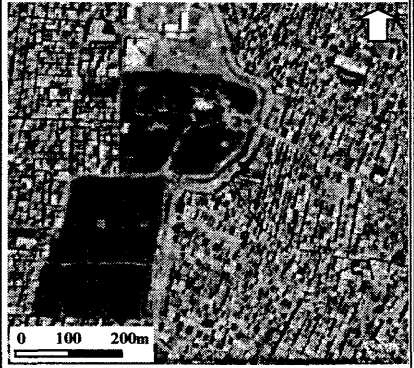

4.1 Informal Urban Expansion Causes

The informal urban expansion causes can be summarized

in the following points:

- 1) Rapid urban population growth is higher than the city formal sector capacity.
- 2) The current bad urban conditions of existing cities are pushing inhabitants to the informal market because:
 - High population densities.
 - Shortage of affordable accommodation and the unaffordable prices of newly built formal housing, associated with the partially free-market cost of housing, excluding the low-income groups from the housing market [24].
 - High price of inner city's land.
- 3) Long and difficult procedures for acquiring formal land subdivision and building permission.
- 4) Laws' defects and control tools' inappropriateness: As plain evidence, Law no. 3/ 1982 (Table 7) didn't clearly identify the urban areas, and even the regulation for establishing a new housing area outside the city boundary is left vague. That is accompanied with

Table 6 Typology of Informal Urban Expansion Pattern of Egyptian Cities

	Characteristics	Deficiencies	Maps *1
Informal Expansion Patterns	Urban Pattern according to street network -Usually linear pattern. -Unplanned subdivisions with high density and low-quality developments [15]. <hr/> Buildings -The buildings are usually solid and are stockpiled over the years and finally a lot of them reach up from five to ten stories. -Buildings not following construction code <hr/> Roads & Streets -Linear, parallel and almost very long with very minimal street width (2-3m). <hr/> Open Areas -No open areas	These expansions are: -Not following either planning or construction laws or technical codes [16]. -Mostly deprived of basic services and infrastructure. -Mostly deprived of open spaces and car parking spaces. -Almost with high densities.	 <p>Informal Expansion over Agricultural Lands on the Peripheries of Giza City</p>
	Urban Pattern according to street network -Mostly linear pattern. <hr/> Buildings These expansions are characterized by: -Replacing rural houses by new high-rise ones (5-12 levels) following no housing or planning codes. -Building over the adjacent agricultural lands <hr/> Roads & Streets -Linear street pattern in case of constructing over agricultural lands. -Bent narrow unpaved streets (2-3m), using the same village streets, in case of replacing the old rural houses by new urban ones. <hr/> Open Areas -No open areas.	These expansions suffer from: -Services shortage. -Absence of the architectural and urban standards. -Heterogeneity in the buildings architectural view. -High densities.	 <p>El-Marg District, Cairo</p>
	-Squatters on publicly owned lands: usually unplanned dispersed developments, depends on the civil code that make the possibility for the violator or the user of a plot of land to gain its ownership if it is occupied continuously for 15 years and if the chief owners do not assert their rights [15]. <hr/> -Around the tombs: Either in temporary units within the cemeteries areas or establishing unplanned housing buildings around these cemeteries in absence of regulations. <hr/> -On the houses roof-tops: Almost light constructions providing just small temporary rooms.	This kind of expansion, whether is less common, is worse than the former pattern (informal settlements on agricultural lands) because of: -Its lack of service. -Poor physical conditions. -Its high population densities. -Lack of urban open spaces.	 <p>Squatting on the Roof-tops Squatting around Tombs</p> <p>Squatting on Public Desert Land</p>

shortage in monetary resources which are needed for laws enforcement and penalties execution for violators [14].

- 5) Withdrawing of private sector from the rental housing market, especially after a series of rent control laws issued after 1952. Then that situation was strengthened in 1970s with the open-door policy, persuading the private sector investing by providing housing for middle and upper-classes. And with regard to the government announcement of its responsibility of low-income housing construction, both of the private and public sectors disengaged from the rental housing market. Consequently, those seeking rental accommodations were denied from access to the formal sector, directing to the informal option [19].
- 6) Inefficient urban solutions as that presented through many of the new cities and informal areas upgrading projects.

4.2 Informal Expansion Problem Features

The informal and uncontrolled urban expansion of Egyptian cities led to many dramatic problems, whose most important features are:

- 1) Agricultural land loss: by urban expansion encroachment that became a major problem in Egypt since 1952 (the revolution and the modern Egyptian era). The total amount of land loss in the previous 50 years was estimated as 1.3 million Feddans (1 feddan = 1.038 acres = 4,200 m²) during the period of 1965 and 2000 in Egypt, almost 50-60 % of this amount of land was consumed by urbanization (about 600 to 700 thousand Feddans), where the rest of the land was swallowed due to several other reasons including the increase of underground water level or salinity of the agricultural land or scraping of land for brick-making [14].
- 2) Bad urban conditions of the informal settlements including:
 - a) Lack of basic infrastructure that has a negative impact both to health and to the development of productive activities.
 - b) Lack of services that represents an excessive load on the city capacity for service provision.
 - c) Inefficient road nets.
 - d) Housing not following building codes mostly suffer from bad ventilation and sometimes bad interior solutions.
- 3) The architectural and urban deficiencies that constitute obstacles to the harmonious growth of cities.

5. URBAN PLANNING LEGISLATIONS AND GOVERNMENT RESPONSES

5.1 Planning and Building Legislations

Egyptian cities, excluding the new ones which have their own schemes of planning and building conditions, passed through historical growth stages without comprehensive planning supported by any legislation or clear future

vision. However, the growth process was almost controlled by non-integrated time-limited plans. The result was that urban growth spread according to land merchants, and so land uses overlapped, and various activities were mixed together. Consequently, financial burdens increased for the authorities in charge of planning and construction, and so the social and human values of the physical environment levelled off [25].

Therefore, several laws and ministerial decrees for planning and building regulating were issued and developed by time, especially after the country revolution in 1952. Unfortunately, these legislations experienced some defects either in their items or in their application means that participated in continuing the problem of the informal expansions (Table 7)

5.2 Government Responses and Their Effectiveness:

To control the problem of the extensive informal expansions of cities, the government introduced many policies and instruments (Fig.11). The most important of which are as follows.

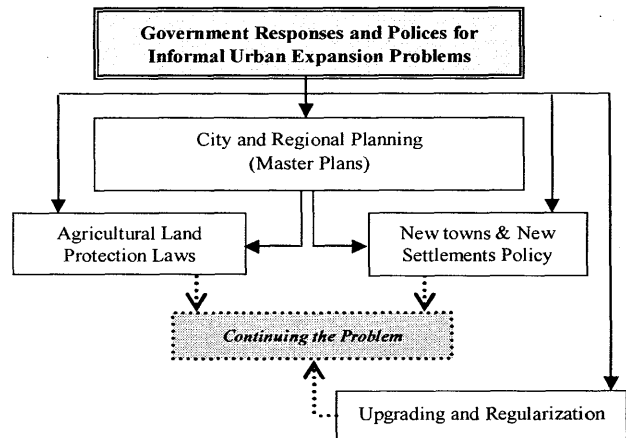


Fig. 11 Government Responses and Policies for Informal Urban Expansion Problems

5.2.1 City and Regional Planning (Master Plans)

To address the problem and redirect the rapid urban growth, master plans were prepared mainly for the big urban and economic centers. The first master plan for Cairo was completed in 1965, and followed by the second one in 1970. In 1980, an updated master plan integrated national policies by recognizing Cairo and Alexandria to control and arrange their development and growth. The main objectives of that master plan included [19]:

- 1) Improving transport efficiency.
- 2) Maximizing the use of existing infrastructure.
- 3) Organizing the urban fabric to improve access to public services.
- 4) Protecting agricultural areas.
- 5) Encouraging the population deconcentration.
- 6) Providing alternatives to informal settlements.

To obtain the last three objectives, the government adopted the policy of new urban poles creation (new towns and new settlements) in the desert.

Table 7 Recent Legislation that Regulate Urban Planning & Building in Egyptian Cities

Urban Legislations	Important Points Concerning with Planning & Building Sequences in Egyptian Cities.
<p>Urban Planning Law No.3/1982 [26]</p>	<ul style="list-style-type: none"> • In the field of general and detailed city plans: <ul style="list-style-type: none"> - It concerned with drawing the main lines for planning without details. - It gave the localities, through the governmental planning committees, the responsibility of preparing the general and detailed plans of the cities (including places requirements of land use, buildings heights, the minimum land area and its dimensions, roads net, and public services places) which later be ratified by the Housing Minister. However, no detailed plans were introduced for the cities except just general ones that show the urban growth areas and their details. • In the field of Land subdivision: The law didn't mention certain planning concepts or typical street hierarchy. But it just mentioned that each land which will subdivided into more than 2 pieces must guarantees the following: <ul style="list-style-type: none"> - 1/3 the land area must allocated for roads, squares, and public parks. - Street width must be appropriate for the expected traffic densities. - Each piece of the divided land must look, at least, over one street. - Buildings closed areas must not exceed 60% of its land, and the open built areas (terraces, stairs, and building entrances) can occupy 10% of the building s closed area. That with possibility of exceptions for exceeding this percent in some districts according to the authority. • For other things like natural lightening: the law was general, mentioning that each subdivision must provide enough natural lightening and ventilation.
<p>Building Regulating Law No. 106/1976 and Its Amendments in 1996 [27]</p>	<ul style="list-style-type: none"> • For the general construction conditions: <ul style="list-style-type: none"> - It s forbidden for any constructions, extension, changes or facades painting until getting permission for that from the Regulating administration for construction works. - The building owner must provide enough numbers and areas of the parking places that match with the building units (1 park/ apartment, 2 parks/ institutional unit in the building). - The building owner must provide enough number of elevators for buildings whose last floor exceeds 16m. • For Buildings heights condition: <ul style="list-style-type: none"> - It is forbidden for any building construction looking over streets less than 6 m width (unless the building must retreat back half of the difference in distance between the 6 m and the original street width). - The building height must not exceed 1.5 the street width (that the building looks over it), with maximum height of 36 m (In critic economic or national needs, the Chairman of the Council of Ministers has the right to minimize or maximize that height in special city areas), with some other height details for the buildings looking over two streets or squares. - These height conditions not applied for cities or new cities that already have detailed plans with their own construction, and density conditions. • Other points concerning with services rooms areas, stairs, and windows areas.
<p>Agricultural Land Protection Law No. 116/1983 [14]</p>	<p>According to that law, it s forbidden to any building or any community to be constructed over agricultural lands, preserving the fallow cultivable lands to be deemed agricultural lands, just with certain exceptions that mentioned as in the following cases:</p> <ul style="list-style-type: none"> - Land falling within city boarders approved until 1/12/1981 (in reality most of these lands were legally or illegally occupied). - Land areas demarcated according to the aerial photo of 1985 and approved by both the Ministry of Agriculture and the Ministry of Housing. - Land on which the government builds public utilities conditioned by the Ministry of Agriculture approval.
<p>New Urban Communities Law No. 59/ 1979 [21]</p>	<p>The New Urban Communities Authority established according to law no. 59/ 1979 with objectives of: creation of new civilized centers, development of new attraction areas, redistribution of inhabitants far from the narrow strip of the Nile Valley, extension of urban spines to the desert and remote areas, and curbing the urban infringement upon the agricultural areas. However, these new communities, each according to its own conditions, follow new urban schemes that concern with zoning, services percentages, and housing conditions, and road hierarchy.</p>

5.2.2 Agricultural Land Protection Laws

Several laws were issued for agricultural land protection including law no. 53/1966, law no. 116/1983 and then the Military Decree no. 1/1996. The latter decree was completely banning development over agricultural land or agricultural land subdivision, stipulating for law disobedience a fine ranging between 10.000 and 50.000 L.E and the jail for the violator for a period of 2 to 5 years [14]. However, the Military Decree no. 1/1996 was abolished in 2004, and law no. 116/1983 became the operative law for protecting agricultural land. According to that law, it's forbidden to any building or any community to be constructed over agricultural lands, preserving the fallow cultivable lands to be deemed agricultural lands just with certain exceptions as mentioned in Table 7.

5.2.3 New Town and New Settlement Policy

Without enough affordable housing for the low-income people, neither strict regulations nor heavy land protection enforcements can stop the expansion of squatter and informal settlements (i.e. an alternative practical option for informality is needed). So, the government, in late 1970s, directed to a new policy to establish new urban communities, starting with constructing the city of “ the

10th of Ramadan”. The city offered an example of the first generation of the new cities later followed by several cities and urban communities in Egypt, of which 19 cities are still under construction with varied rates. In addition, construction works were implemented in 4 new cities by the beginning of the year plan 2002/03; namely, New Qena, New Fayyoun, Akhmim and Toshka [28].

The new cities in Egypt are distributed as follows:

- 1) Eight near Greater Cairo: 10th of Ramadan, 15th of May, 6th of October, Badr, el-Obour, al-Sheikh Zayed, al-Shorouq and New Cairo.
- 2) Five in Lower Egypt: al-Sadat, Borg al-Arab, al-Salehiya, New Damietta, and New Noubariya.
- 3) Six in Upper Egypt: New Beni Sueif, New Menya, New Assuit, New Sohag, New Teiba, and New Aswan.
- 4) Four under construction: Toshka, New Qena, New Faiyoum and New Akhmim.

5.2.4 Regularization of Informal Settlements

The government in late 1970s and early 1980s directed to apply a policy for upgrading informal settlements (mainly on private lands excluding the squatters situation), by providing basic infrastructure, social services and regularizing land tenure. The main factors led the

government towards this attitude include:

- 1) A pressure from the international donor organizations.
- 2) The implementation of structural adjustment policies that encouraged a redirection of infrastructure investment towards direct support for economic growth.
- 3) The government desires to regain control over these large areas spreading in the cities.

In 1984, after passing a series of laws and decrees, a law was issued as a frame work for allowing squatter's residents to regularize their situation by buying their plots from companies and private developers who bought these public lands from governorates and took the responsibilities for its upgrading, according an issued law in 1981.

Many upgrading projects were supported by the participation of the government, the World Bank and international donors, such as the upgrading projects that applied in Manshiet Naser-Cairo (1979) and Nasseriya-Aswan (1986).

After a while, there was a major concern of government authorities about that upgrading informal settlements would be condoning an illegal act and would encourage the development of more informal areas.

In 1993, after a stoppage period in upgrading projects and retreating of the governmental role as a housing provider, there was an announcement on the beginning of the intensification of a national effort to upgrade informal settlements all over Egypt [19].

From above and despite of its persistent endeavours, the government hasn't successfully achieved its objectives for solving the informal expansion problem, that's mainly because of:

- 1) Still inappropriate control tools.
- 2) Defects in housing location management and land development processes in the New Cities Project: as it faced by number of obstacles linked to the choice of sites, the status of the land and water supply. Moreover, it became mostly accessible by the middle income households due to the high transportation costs, extremely high infrastructure costs and the declination in the number of subsidized housing lots for the low income groups.
- 3) The informal expansions upgrading projects, despite their importance for solving their urban degradation problem, have tempted the development of more informal areas accompanied with control tools inappropriateness. As squatters know that by time through laws' loopholes, they can finally get their housing and the required infrastructure.

6. CONCLUSION

It is observed from the research on the urbanization of Egypt that more than 50% of the urban population concentrated in just few big cities because of polarization policies that favoured these urban centers. However, population growth rate of most of Egyptian cities has

slowed down in recent years between 1996 and 2006 except the big centers like Alexandria and Cairo, and other cities in the Upper Egypt as El-Minya, Mallawi, Gerga and Luxor, which are mainly caused by rural-to-urban migration.

The desert governorates (Matruh, New Valley, North Sinai, South Sinai, and Red Sea) witnessed a remarkable high percentage of population change, especially South Sinai (89% during 1986 and 1996, 172% during 1996 and 2006). That's due to the remarkable change after being sparsely populated, the government directed to develop densely the area depending on tourism development of Sea Coasts. However, these governorates still scarcely populated representing just 1.77 % of the country total population in 2006. That can be explained by the development concentration in just small areas of the governorates along Sea Coasts while leaving the rest of their vast areas undeveloped.

From analyzing the cities' expansion patterns and trends, it's found that urban degradation of their urban form became a serious problem due to the continuous informal expansions. These expansions represent a real economic threat that swallowed about 80% of the agricultural lands mostly located on cities' peripheries [14].

And despite of the persistent attempts of the government and the recurrent researches, especially for the great centers such as Cairo and Alexandria, the problem still continuing out of control, and that's mainly due to:

- 1) Still inappropriate control tools for land protection.
- 2) Long and difficult procedures for acquiring formal land subdivision and building permission.
- 3) Withdrawing both of the private and public sectors from the rental housing market [19].
- 4) Inefficient urban solutions that presented in the new cities and informal areas upgrading projects.

Actually, most of Egyptian big or medium-sized cities suffer from that problem in different rates. Thus, the study here draws a thorough vision for the urban expansion problem, the governmental responses and their effectiveness in solving it for subsequent studies for sustainable urban solutions.

NOTE

- *1. All the air-photos are based on Google Earth, Image NASA, 2008.

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